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NAVY PUBLIC WORKS CENTER

NORFOLK, VIRGINIA

UTILITIES DEPARTMENT

STANDARD OPERATING PROCEDURE / JOB HAZARD ANALYSIS

TITLE

ADD/REPLACE INSULATING OIL TO 34.5 KV OIL INSULATED CIRCUIT BREAKER

PROCEDURE NUMBER

WC 622 HVE 016

DISTR:
Code 601C.3
Code 610.E1
Code 620
Code 622
Code 622.1
Code 622.3

SIGNED:_____
(DATE)

APPROVED:_____
(DATE)

SAFETY PROFESSIONAL:_____
(DATE)

MANAGEMENT OFFICIAL:_____
(DATE)

DATE:_____ REVISION DATE:_____

ADD/REPLACE INSULATING OIL TO 34.5 KV OIL INSULATED CIRCUIT BREAKER

Procedure:

Procedure to add or replace insulating oil to a 34.5 kv, oil insulated, circuit breaker.

Potential Energy Sources:

1. 34.5 kv outdoor bus, isolation switches, and underground cables.
2. Circuit breaker hydraulic, pneumatic, or spring motor operating mechanism.
3 Circuit breaker 120/240 AC power.
4. Circuit breaker 125 DC power.

Tools and PPE:

Tools: Oil pump/filter unit, fill/charge hose assembly with fittings, fiberglass ladder, and hand tools. PPE: Work gloves, oil resistant safety shoes, safety glasses.

References:

1. PWC Occupational Safety and Health Program Manual, PWCNORVAINST 5100.33E
2. SOP# 600 HVE 6, PWC Switching Or Breaker Operation
3. Occupational Safety and Health Standards for General Industry (29 CFR PART 1910): Subpart I, Personnel Protective Equipment; Subpart R, Electrical Power Generation / Transmission / Distribution; Subpart S, Electrical
4. NFPA 70 E, Approach Distances To Exposed Energized Electrical Conductors and Circuit Parts
5. ANSI C2-1987, National Electrical Safety Code
6. PWC SOP WC 622 HVE 013, Hazardous Energy Control (Lockout, Tagout)

Procedures:

1. Assess conditions around the circuit breaker.

2. Perform switching operations to shift breaker load to alternate circuits. Refer to SOP# HVE 6, PWC Switching Or Breaker Operation, and SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout) for procedure and PPE required.

3. Open circuit breaker. Refer to SOP# HVE 6, PWC Switching Or Breaker Operation, and SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout) for procedure and PPE required.

4. Open, tag, and lock breaker isolation switches. Refer to SOP# 600 HVE 6, PWC Switching Or Breaker Operation, and SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout) for procedure and PPE required.

5. Test breaker bushings to verify breaker has been deenergized. Before the bushings are checked, test the high voltage tester on a known energized circuit to verify the tester is working. Test each bushing separately, taking care not to cross phase during test. If voltage is detected, stop the test. If no voltage is indicated, retest the high voltage tester to re-verify it is working properly. Wear PPE listed in SOP 600 HVE 6 to test the breaker.

6. Attach grounds onto the breaker. To attach grounds, first connect one ground cable end to station ground, or a grounded structure, then attach the other end to a fiberglass shotgun stick. Using the shotgun stick bleed off any static build up on the breaker bushing. Once the static has been bled off, attach the ground cable to the bushing using the shotgun stick. Repeat for each phase. Follow SOP WC 622 013, Hazardous Energy Control(Lockout, Tagout), concerning ground tags. Wear PPE listed in SOP 600 HVE 6 to ground the breaker.

7. Open all control blades in breaker control cabinet. Test, with a voltmeter, that the load side of these switches is dead. Avoid contact with electrically energized parts and be careful not to touch moving parts of operating mechanism while switching. Wear Nomex coveralls, work gloves, safety shoes, and safety glasses.

8. Add/replace insulating oil. Wear Nomex coveralls, work gloves, oil resistant safety shoes, and safety glasses.

<u>Adding Oil</u>

Check the existing oil visually .

⇒ If oil is in poor condition visually(black, carbonized, sludge present) drain and replace the oil per replacement procedure.

⇒ If oil is visually good(clear or amber colored) then proceed with the pumping procedure.

<u>Replacing Oil</u>

Drain the oil and visually inspect the removed fluid.

⇒ If drained oil is in poor condition visually(black, carbonized,

sludge present), lower the tank and clean the breaker's internal parts and the tank.

⇒ If drained oil is visually good(clear or amber colored) then proceed with the pumping procedure.

Pumping Procedure

⇒ Prior to pumping, test the new oil's dielectric strength. The dielectric strength should be greater than, or equal to, 30 KV. If the oil does not test at this level, obtain another container of oil and sample it. Repeat till the a container of oil tests at 30 KV.

⇒ Connect pump/filter and hose assembly to breaker's bottom drain valve.

⇒ Turn pump on and open the breaker's drain valve's test port. Pump oil into a container till no air bubbles are present in the oil stream. At this point close the test port; open the drain valve and fill the tank to the proper level.

⇒ After pumping, test the breaker oil's dielectric strength. If job was to add oil, then the oil dielectric strength should be greater than 25 KV. If job was to change oil then the oil should test at 30 KV or greater. If the oil does not test at these values, then the oil has to be filtered till it does. Refer to settling time paragraph below.

⇒ If air has been introduced into the breaker's insulating oil by (a) not following the pumping procedure, (b) air bubbles in the oil stream, (c) air pumped into oil due to emptying the new oil container, (d) oil has been through a filter operation, then the breaker will have to have a settling time of 8 hours. The settling time can be reduced to 1 hour by placing a vacuum in the oil tank. Do not exceed the tank's pressure strength. If this is not known then a 3 psig vacuum should be used.

9. Close all control blades in breaker control cabinet. Avoid contact with electrically energized parts and be careful not to touch moving parts of operating mechanism while switching. Wear Nomex coveralls, work gloves, safety shoes, and safety glasses.

10. Remove the grounds attached to the breaker. Test that the breaker bushings are still deenergized using a high voltage tester. Before the bushings are checked, test the high voltage tester on a known energized circuit to verify the tester is working.

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OIL INSULATED CIRCUIT BREAKER

Test each deenergized bushing separately, taking care not to cross phase during test. If voltage is detected, stop the test. If no voltage is indicated, retest the high voltage tester to re-verify it is working properly. After the bushings have been verified dead, remove the grounds using a fiberglass shotgun stick. Remove the ground cable end attached to the bushing first, then remove the end attached to station ground, or a grounded structure. Wear PPE listed in SOP 600 HVE 6 to remove the grounds.

11. Remove the locks and tags from the breaker isolation switches and close the devices. Refer to SOP 600 HVE 6, PWC Switching Or Breaker Operation, and SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout) for procedure and PPE required.

12. Close circuit breaker. Refer to SOP# HVE 6, PWC Switching Or Breaker Operation, and SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout) for procedure and PPE required.

13. Perform switching operations to shift breaker load back to breaker from alternate circuits. Refer to SOP# HVE 6, PWC Switching Or Breaker Operation, and SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout) for procedure and PPE required.

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